(12) UK Patent Application (19) GB (11) 2 207 660 (13) A

(43) Application published 8 Feb 1989

(21) Application No 8815631

(22) Date of filing 30 Jun 1988

(30) Priority data
(31) 8715328 (32) 30 Jun 1987 (33) GB

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(51) INT CL⁴
B65H 3/22

(52) Domestic classification (Edition J):
B8R 416 471 AJ6
U1S 1561 1588 1597 B8R

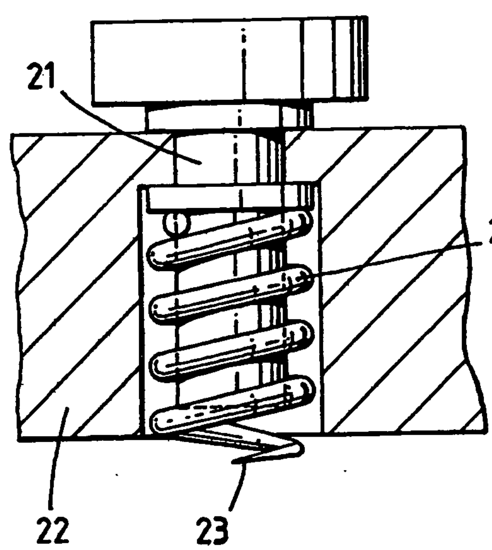
(56) Documents cited
EP A 0239948 US 4042271

(58) Field of search
B8R
Selected US specifications from IPC sub-class
B65H

(54) Fabric lifting device

(57) The device, which may be used for FRP sheets, includes a framework 10, Fig.1, having helical, resilient assemblies 11 rotatable thereon and may be mounted on the end 12 of a robotic arm. In Fig.2, a helical spring 20 on a spindle 21 is rotatable in structure 22 of framework 10, the spring terminating in a needle point 23. In use, framework 10 is manoeuvred against sheet 13 and assemblies 11 rotated so that the needles penetrate the fabric and enable it to be lifted. In alternative arrangements, the assembly may comprise a double helical spring (Figs 3) or a plurality of part-helical needles (Figs 4,5,6).

Fig.2a.



The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

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Fig.1.

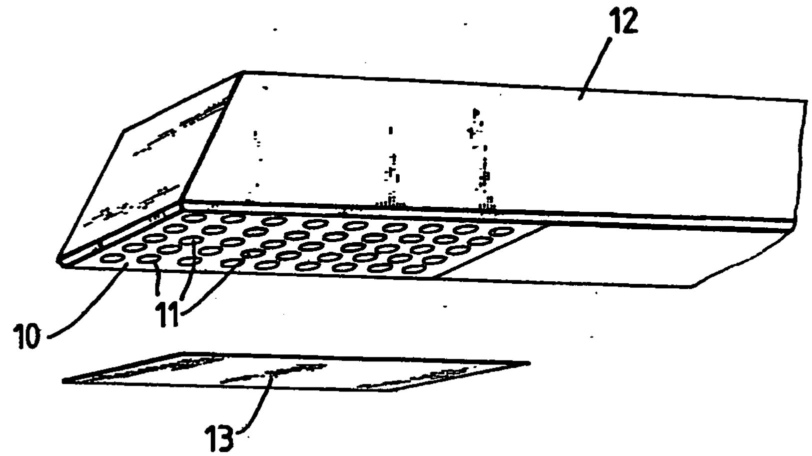


Fig.2a.

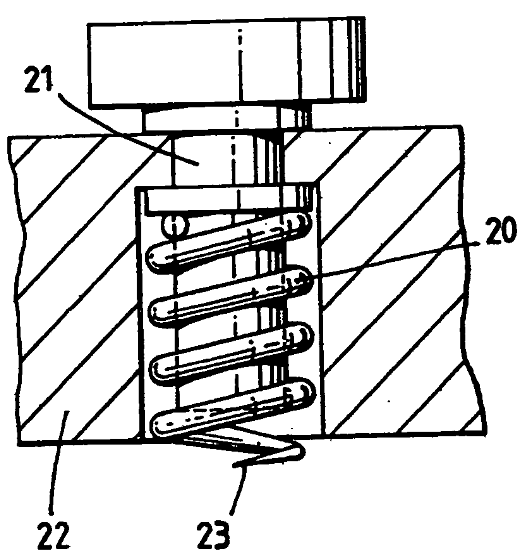


Fig.2b.

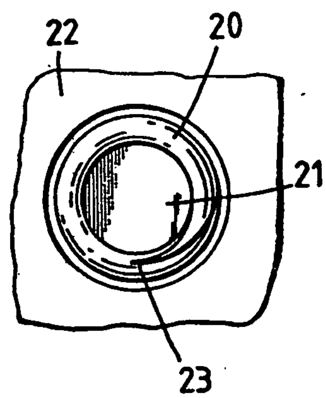


Fig.3a.

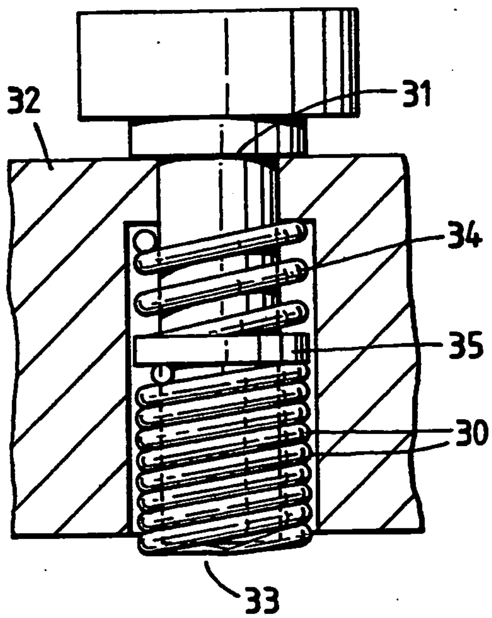


Fig.3b.

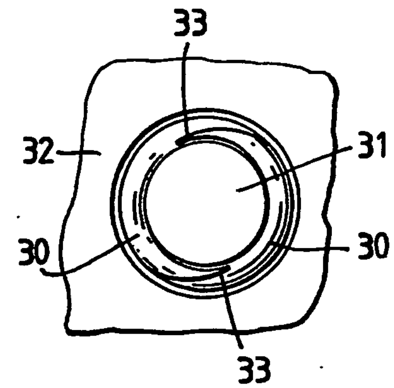


Fig.4a.

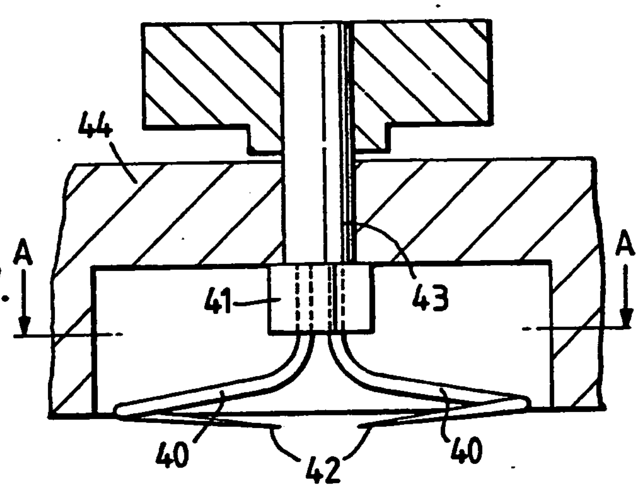


Fig.4b.

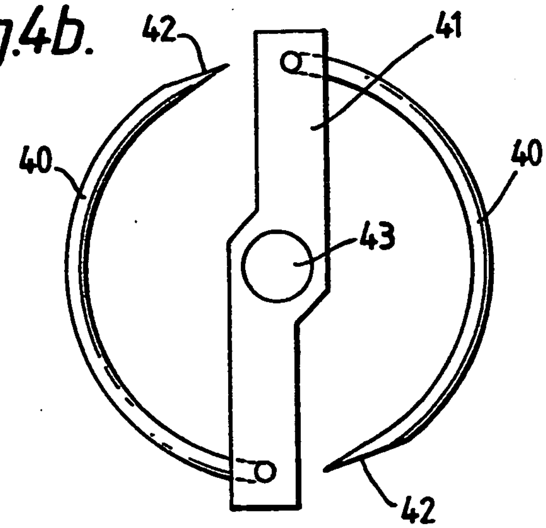


Fig.5a.

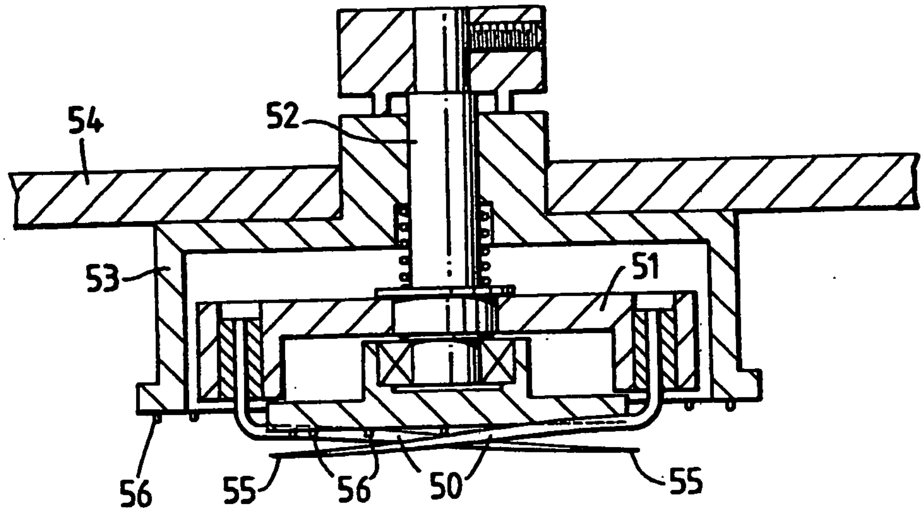


Fig.5b.

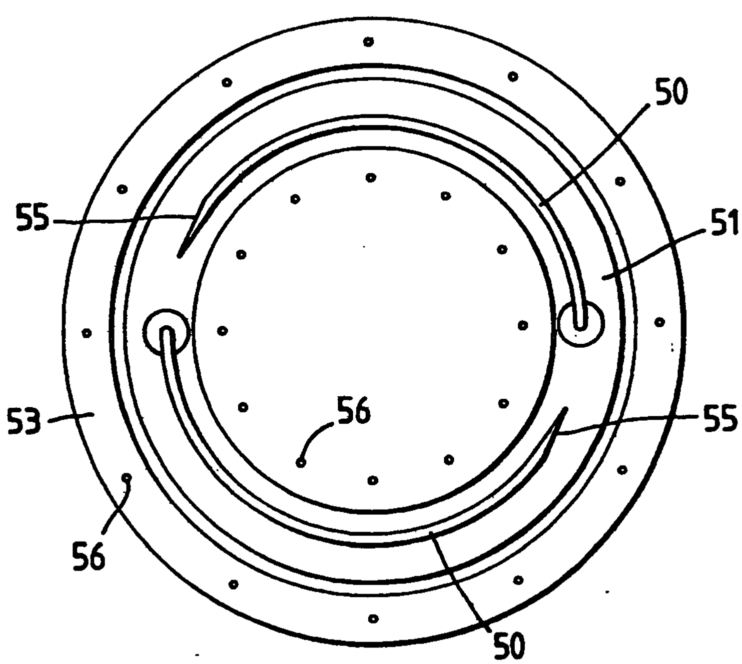


Fig.6a.

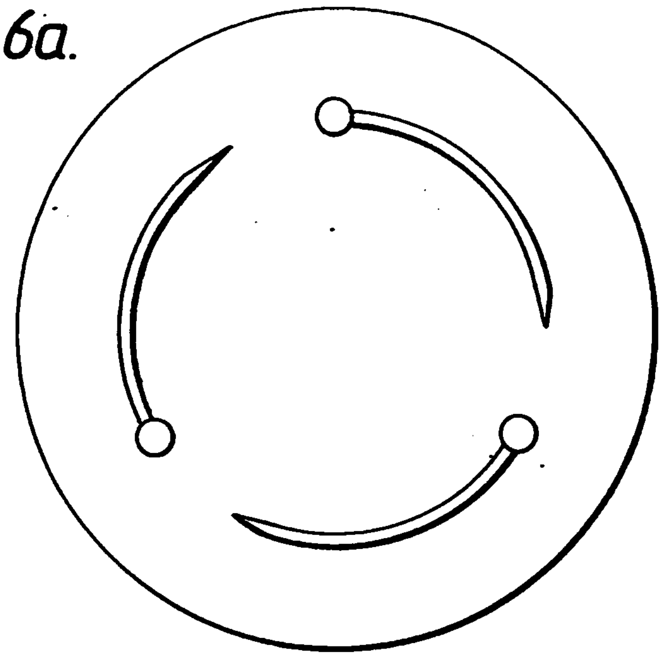


Fig.6b.

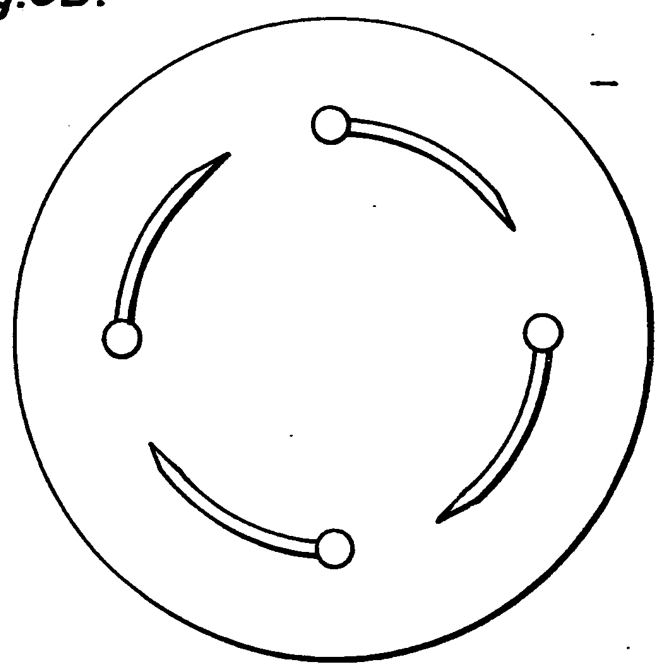


Fig.6c.

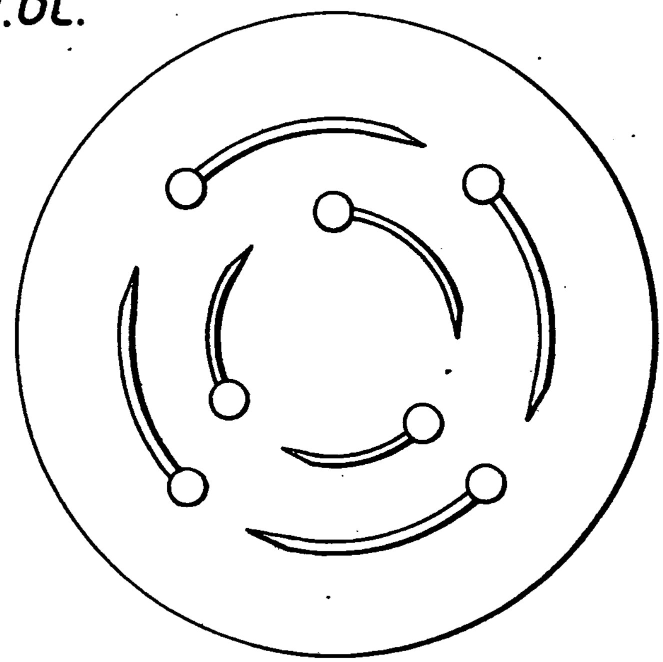
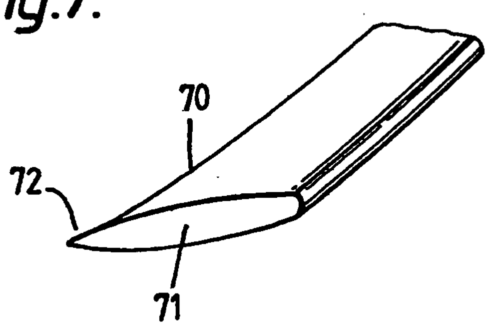


Fig.7.



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FABRIC LIFTING DEVICE

The present invention relates to fabric lifting devices. Many fabrics are formed by processes which include a stage where the fabric, in an intermediate condition, has to be lifted and moved. This can prove troublesome when the fabric in its intermediate condition is fragile. Examples of fabrics which have to be moved in such a condition are Fibre Reinforced Plastic (FRP) materials where sheets of material are prepared from a matrix of fibres which may be woven, or aligned undirectionally and held together in a sheet form by, for example, a weft thread or a backing of adhesive scrim. These sheets are impregnated with resin, either before or after being manoeuvred onto formers. On the formers the resin impregnated fibres are shaped and heat-treated to cure the resin. Very strong, lightweight and corrosion resistant components can be manufactured from FRP materials, but the sheets of fibre matrices, whether impregnated with uncured resin or dry, are hard to handle. It can also be difficult to remove the protective backing sheet (where present) which may be of, for example, nylon or polythene and which must be removed before the resin is cured.

According to the present invention a fabric lifting device includes a framework having a plurality of helical resilient assemblies, each assembly being rotatable about a helix axis and terminating in at least one needle point.

Frameworks according to the invention can conveniently be mounted on specialised automated machinery, such as the types of machinery which use robotic arms.

Each assembly may include one or more helical coils, or one or more arcs of a helix.

In one embodiment of the invention each needle point has a surface facing away from a helix mounting point which is planar in the plane normal to the helix axis. The needle point preferably has a shaped and rounded tip.

Some embodiments of the inventions will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, of which:

Figure 1 is a perspective view of a robotic arm having a

framework according to the invention attached thereto.

Figures 2 to 5 show embodiments of assemblies for use with the invention, (a) figures being elevations in section and (b) being plan views.

Figures 6a to 6c are plan views of more needle arrangements, and

Figure 7 is a perspective view of a needle point. A framwork 10 has a plurality of helical resilient assemblies 11 rotatably mounted thereon. Each assembly terminates in a needle point (not shown in this figure). The framework 10 is mounted on an end 12 of a robotic arm.

In use the robotic arm is manoeuvred such that its end 12 brings the framework 11 against a sheet of fabric 13, for example a sheet of uncured resin impregnated FRP material, such that the needle points are resiliently pressed against the sheet 13. The assemblies 11 are then rotated, and the needles penetrate the fabric. The fabric is then supported on the many helical portions of the assemblies 11, and the robotic arm can be manoeuvred to raise the end 12 and position the framework 10 and attached sheet 13 adjacent to a former (not shown) whose shape the sheet 13 is required to adopt.

The sheet 13 is positioned against the former by suitable adjustment of the end 12 of the robotic arm, the assemblies 11 are rotated such that the points detach from the sheet 13, and the arm 12 is moved away leaving the sheet 13 positioned against the former.

In one form of assembly 11 for use with the invention a helical spring 20 is mounted on a spindle 21 rotatable in structure 22 of the framework 10. The spring 20 terminates in a needle point 23 which projects slightly beyond the structure 22.

In an alternative form of this assembly (3) a double helical spring 30 is mounted on a spigot 31 rotatably positioned in structure 22, the double helical spring terminating in a pair of needle points 33 positioned 180° apart.

Resilience in this assembly may be provided by an auxiliary compression spring 34 acting between structure 32 and an annular flange 35, slideable on the spigot 31, on which are mounted the

double helical springs 30.

In another assembly for use with the invention (Figure 4) a pair of arcs 40 of a helix are mounted on an arm 41 and terminate in needle points 42. The arm 41 is mounted on a spigot 43 rotatably mounted in structure 44 of a framework 10.

In an alternative embodiment of Figure 4 (Figures 5) arcs 50 are mounted on a needle carrier 51 which is axially slideable on, but constrained to rotate with, a spigot 52 rotatably mounted in a housing 53 which is secured to structure 54 of the framework 10. Each ar 50 terminates in a needle point 55. Pins 56 on the housing 53 and on a pressure pad 57 resist any tendancy of material to twist as the needle points 55 enter therein.

Embodiments of the assemblies of Figures 4 and 5 may have more than 2 arcs 40, 50, as is illustrated in the plan views shown in Figures 6A to 6C.

Each needle point (70 in Figure 7) preferably has a planar surface 71 lying in a plane normal to the axis of the associated helix and a tip 72 which is shaped and rounded. In use, this enables a needle point 70 to penetrate fabric of a sheet 13 but prevents it from penetrating the harder material of any protective film of, for example, nylon or polythene, so enabling the fabric to be stripped from the backing sheet.

It will be realised that mechanisms for rotating the assemblies described above with reference to Figures 2 to 6 are well known in the art of automation, form no part of the present invention, and hence will not be described herein.

It will also be recognised that assemblies can rotate in the same direction (for example clockwise to engage, anti-clockwise to disengage), or with adjacent assemblies or lines of assemblies acting in contra-rotation.

CLAIMS

What is claimed is:

1. A fabric lifting device including a framework having a plurality of helical lifting assemblies, each assembly being rotatable about a helix axis and terminating in at least one needle point.

2. A device according to Claim 1 wherein each assembly includes one helical coil.

3. A device as claimed in Claim 1 wherein each assembly includes a plurality of helical coils.

4. A device as claimed in Claim 1 wherein each assembly includes an arc of a helix.

5. A device as claimed in Claim 1 wherein each assembly includes a plurality of helical arcs.

6. A device as claimed in any one of Claims 1 to 5 wherein each needle has a surface facing away from a helix mounting point, the surface being planar in the plane normal to the helix axis.

7. A device as claimed in any one of Claims 1 to 6 wherein each needle point has a rounded tip.

8. A device substantially as herein described with reference to Figures 2 to 7 of the accompanying drawing.

9. Machinery including a robotic arm having mounted therein a device as claimed in any one of Claims 1 to 8.

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